

THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1943

As in the preceding two years, because of war conditions and the concomitant unsettled economic situation, no special appeal was made for extra-budgetary support; yet the total gifts to the Arboretum were impressive, including \$925.00 for publication, \$2346.27 for general unrestricted purposes, \$1050.00 from the Committee for Inter-American Artistic and Intellectual Relations, to cover the expenses and emolument of Dr. Armando Dugand, Director of the Instituto Biologico of Bogotá, and a grant of \$500.00 from the American Philosophical Society for my use in connection with the study of our accumulated collections of Chinese material. In connection with the botanical survey of the Alcan Highway, discussed below, Dr. H. M. Raup received a grant of \$1500.00 from the Milton Fund of Harvard University, supplemented by a grant of \$500.00 from the Bache Fund of the National Academy of Sciences and one of \$600.00 from the General Purpose Fund of the American Academy of Arts and Sciences. The latter organization also granted \$150.00 to Professor Rehder for his use in connection with the completion of his bibliographic index. Five hundred dollars was received from the War Department to enable us to prepare the necessary illustrations for a treatise on emergency food plants for the Old World Tropics. An important gift to endowment was the receipt of \$50,000.00 in December from Miss Louisa W. Case of Weston, together with her estate in Weston, consisting of 59 acres of land with the buildings thereon, assessed at \$84,000.00, but actually valued in excess of that figure, for the buildings alone are insured on their appraised value of \$114,450.00. This gift is a memorial to her father, Mr. James B. Case. While under the terms of gift the Weston property may be sold after a period of three years and the proceeds added to the James B. Case fund, it is our hope and desire that the Case estate be developed and maintained as an adjunct to the Arnold Arboretum. The annual accretions to capital under the terms of gift of the James Arnold and Charles Sprague Sargent funds were credited to these funds as usual. The James R. Jewett and the Vieno T. Johnson prizes were awarded in August in accordance with the terms of gift.

In passing, the badly overcrowded condition of the library, and especially of the herbarium, is again mentioned, although the library situation has been somewhat alleviated through the transfer of certain forestry periodicals to the Harvard Forest at Petersham on deposit. The overcrowded herbarium situation can be alleviated only by additional construction, and even if funds were available for this purpose, which is not the case, an addition to the Administration Building could not be accomplished at this time because of the present restrictions on building material.

Staff. — The staff remains about the same as in the preceding year, only one member of the technical staff having been drafted for military service, this being Dr. C. E. Kobuski, who was granted leave of absence when he was inducted into the service in October. Dr. F. P. Metcalf resigned in April, 1942, when he was commissioned in the United States Army. Dr. Armando Dugand, Director of the Instituto Biologico of Bogotá, Colombia, was appointed Research Associate during the period that he was in the United States under the auspices of the Committee for Inter-American Artistic and Intellectual Relations, September 1, 1942 to March 1, 1943.

Instruction. — Several staff members continue to coöperate with the Division of Biology of Harvard University in offering undergraduate and graduate courses and in supervising the research work of candidates for advanced degrees. The number of graduate students has decreased because of war conditions, but the demand for certain types of undergraduate instruction has increased to provide for the needs of special groups of students in residence at Harvard under the auspices of the Army and the Navy. To meet this situation we have waived the condition of a half-unit course every other year on the part of our staff members, and for the duration of the present emergency our staff members may be called upon for more course work supervision than would normally be the case.

Buildings and grounds, including horticulture. — Normal maintenance of all buildings has been provided for, the most important items being essential furnace repairs and the installation of a new pipe line from the water main on the Arborway to the Administration Building.

In assimilating large collections of living plants from various parts of the world, it becomes necessary from time to time to re-check the living plants already in cultivation to detect duplications, as well as those which are incorrectly named. This was done with the lilacs last year, and this year the difficult genera *Weigela*, *Philadelphus*, *Deutzia*, and *Rosa* were carefully examined. In many cases it was found that we were growing far too many duplicates, and in an equally large number of cases it was found that, on examining and comparing the horticultural varieties in flower, many supposedly different varieties were identical, even though they had been received from widely separated sources and had been growing here for many years under different names. The checking and re-identification of these groups took considerable time, but it is necessarily one of the important functions of an arboretum. At present the number of species and varieties of these groups represented in the living collections is *Deutzia* 63, *Philadelphus* 103, *Rosa* 241, and *Weigela* 56.

During the past year, 576 different kinds of plants were transferred from the nursery to the living collections, many of these being entirely new accessions. Including desirable duplicates, a total of 826 living plants was added during the current year. In addition, approximately 300 crab apple

and oriental cherry seedlings were planted in the field near the Palmer house and in the Walter Street tract.

Included among the many new plants added to the collections this year was a collection of *Clematis* hybrids, the gift of Mr. Louis Vasseur of Milton, Massachusetts. Mr. Vasseur has specialized in the growing of *Clematis* hybrids for years and gave the Arboretum sixty of these in the fall of 1942. These were planted on the six-foot woven wire fence at the rear of the *Aesculus* collection. Another large collection of named varieties of *Clematis* was given by the James I. George Company of Fairport, New York, specialists in *Clematis*. These were planted in the nursery in the fall of 1942 and came through the cold winter remarkably well, but since that time many of them have unfortunately become seriously infected with disease.

The past winter was unusually severe, with temperatures at times well below zero. While there were only six days when the temperature fell below zero, as registered at the Arboretum greenhouses, more winter injury occurred to plants than at any other time since the severe winter of 1933-34. A detailed discussion of the winter injury and the species and varieties injured is included in *Arnoldia* 3: 25-36. 1943.

A survey was made of all the crab apples being grown in North America at the present time, in conjunction with a committee of the American Association of Botanical Gardens and Arboretums, of which Dr. Wyman was chairman. The study had as its objective the collecting of all available information about the crab apples being grown today and listing this information in convenient form together with complete bibliographical and source data. A greater part of the work was done in the collections of the Arnold Arboretum, and the report will be published in July, 1943.

During the year a total of 1713 living plants was received, chiefly from various parts of the United States, but including a few from Canada, and even three from England. In addition, 171 lots of scions and 59 packets of seeds were received. Distribution of material to other institutions and to individuals totaled 1542 living plants, 94 lots of scions, and an unrecorded number of seeds.

Under a policy inaugurated last year, approximately twenty of the larger nurseries in the United States and Canada were selected which were interested in new and rare plants and which were listed to receive living specimens of new and rare varieties grown by the Arboretum. These plants were not to be sold by the nurseries but were to be used as stock plants. This arrangement was enthusiastically accepted by the nurseries, thus insuring a properly controlled outlet for new or rare shrubs and trees of ornamental value. The first year of operation proved to be highly satisfactory to everyone concerned.

Due to the seriousness of the food situation, some of the experimental land and some of the nursery space was assigned for garden work to twenty-seven staff members and to individuals working in neighboring institutions, and one area to a Boy Scout troop.

At the James B. Case estate in Weston, mentioned above, one hundred

and thirty crab apples and oriental cherries were planted late in 1942 in one of the large fields and over 200 trees and shrubs were established in a nursery. The grounds are being maintained in good condition, and it is hoped that this estate may be maintained and developed as a permanent adjunct to the Arboretum, near the city, yet remote enough to enable us to accomplish various types of work without interruptions entailed because of the urban location of the Arboretum proper.

The Arboretum has had its share of "war troubles," but the staff is trying to carry on as well as it can under the circumstances. The curtailment in gasoline and labor and inability to obtain new mechanical equipment and repair parts for old machines are the chief causes for conditions noted by the public. We are trying to maintain the grounds and the collections in good condition with the equipment and help available. At the present time there is no one in the mapping and labeling department, both the young men formerly employed for this work having left, one to engage in war work, and the other to join the Army. Because the actual mapping work was completed, it is possible to let some of the routine remain dormant a year, but it does create many difficulties, some of which are unforeseen. However, the difficulties encountered in the maintenance of the living collections, though very real to us, are of the general type encountered everywhere during these unsettled times.

The War Effort. — This is not a discussion of war problems that the institution faces because of shortages in labor and materials due to war conditions. At first sight it would seem that a botanical institution could contribute little to war purposes, and yet what we have been able to accomplish is of considerable significance. Staff members have been at the service of both State and Federal governments in supplying horticultural and botanical information on camouflage problems, and a joint Camouflage Research Committee was set up consisting of staff members of the Arboretum, the Maria Moors Cabot Foundation for Botanical Research, the Harvard Forest, and the Biological Laboratories of Harvard University. The investigations undertaken by this group, in association with the United States Army Engineer Board at Fort Belvoir, were not competitive, but were coöperative, in that our investigations were supplementary to those prosecuted elsewhere. In addition to supplying special lists of plants suitable for camouflage purposes to the Army officials, a series of experimental studies on methods of prolonging the life of cut branches was initiated, and this was done with both native and exotic (European and Asiatic) species. Dr. Wyman has been a member of the Camouflage Committee of the Massachusetts Committee on Public Safety since its inception.

In addition to the camouflage investigation work, much time has been given to various emergency matters. Data have been freely supplied to officials in various branches of the armed services regarding poisonous plants and emergency food plants. In September, through the National Research Council, because so many conflicting agencies were becoming

interested in the problem, I was drafted to prepare for the Quartermaster's Department, United States Army, a treatise on the potential food and poisonous plants of the Old World Tropics. Work was commenced on this about September 15, 1942, and the completed copy, with illustrations, was sent to Washington on January 15, 1943. It was issued April 15, 1943, in a very large edition, as Technical Manual 10-420, under the title "Emergency Food Plants and Poisonous Plants of the Islands of the Pacific," pp. 1-149. *fig. 1-113*. It covers all of Polynesia, Melanesia, Malaysia, and the Philippines, and for all practical purposes all of tropical Asia. In addition to special work in this field I have had to go to Washington every two months to lecture on the same subject to each incoming group of trainees in the intensive course on tropical medicine at the Army Medical School.

Botanical Survey of the Alcan Highway. — In the early part of 1943, with the announcement of the opening of the Alcan Highway, it occurred to me that here was a real opportunity to accomplish some productive field work in a hitherto little known area. I accordingly suggested to Dr. H. M. Raup, who had conducted eight botanical field trips in northern Canada, that it would be a good idea to plan for a trip along the Alcan Highway perhaps in 1944 or 1945. In preparation for such a trip Dr. Raup applied for a grant from the Milton Fund of Harvard University. After the application was made it developed that the Joint Economic Committee, Canada-United States, was much interested in having the botanical survey made at once, because certain data were needed by the local authorities now. The Committee took up the matter with the military authorities and secured not only the necessary permission but also their coöperation. The National Museum of Canada is also coöperating. As noted earlier in this report, the Milton Fund grant of \$1500.00 was made and \$1100.00 was received from other sources. It was then decided to add a glacial geologist to the group, and Dr. Charles S. Denny of Wesleyan University was selected. He secured the necessary permit to be absent from the University for the summer and further secured a grant of \$900.00 from the Penrose Fund of the American Geological Society to cover his traveling expenses. Still later the services of Dr. Donovan S. Correll were secured as assistant botanist, by providing funds to reimburse the Botanical Museum for his salary during the time he would be in the field. The party, consisting of Dr. and Mrs. Raup, their two sons, Dr. Correll, and Dr. Denny, left Boston on May 31, and is expected to return about the middle of September. Meagre reports received from the field indicate a most successful summer campaign.

Cytogenetics. — The plant breeding work has resulted in new and interesting types of *Forsythia*, lilacs, roses, and ornamental apples and cherries. Several dwarf or compact types of *Forsythia* appear to be of particular interest. Among the hybrid cherries, one of the segregates is a

semi-double-flowered form of the *Prunus subhirtella* type which is very hardy and which remains in flower for two weeks. Of the several hundred apple hybrids which have flowered, six have been selected for propagation and further testing. Polyploid forms of *Forsythia* and *Philadelphus* have been produced. One of the polyploid forsythias bloomed freely after the severe winter, which destroyed the flowers of most species. This plant has large flowers which are darker than those of the diploid species. The polyploid *Philadelphus* has large flowers but the petals are thick and they fall quickly. Seedlings of this plant may prove to be of value. Cytological work has been limited to the continued study of X-ray effects on chromosomes and on the viability of seeds and seedlings.

Wood Anatomy. — Professor Bailey and Dr. Nast have continued their collaboration with Dr. Smith in the study of woody ranalian families. Intensive investigations of the floral and vegetative organs of the Degeneriaceae and Himantandraceae have shown that these families are closely related to the Magnoliaceae. The three families form a compact group within the Ranales, being more closely related to each other, on the basis of important morphological details, than any one of them is to other families. On the contrary, the Winteraceae exhibit no close relationship to the Magnoliaceae either florally or vegetatively. Nor do they exhibit close affinities to the Schizandraceae, Trochodendraceae, or other specific ranalian families. The remarkable carpels of the Winteraceae rival their vesselless wood in morphological significance. The palmately 3-veined megasporophylls are adaxially folded or conduplicate and bear numerous ovules on their morphological upper surface. In other words, the ovules are not attached to the margins of a classical, involute, sealed sporophyll. The conduplicate, open carpels of *Degeneria* and of the Section *Tasmannia* of *Drimys* afford significant clues for re-interpreting the carpellary structures of the Ranales, and in all probability of the angiosperms as a whole.

The Herbarium. — A total of 20,050 specimens was mounted during the year, and of these 16,476 were inserted into the herbarium; the remaining were herbaceous specimens not kept in the Arboretum collections. The herbarium now includes a total of 608,732 specimens.

The number of specimens received by exchange, gift, subsidy, purchase, or for identification was 22,585. The greater part of these — 17,519 specimens — was from North and South America, while the remainder may be broken down geographically as follows: from Polynesia, 3,477; from India, 976; from Australia, 314; from Africa, eastern Asia, and Europe, 299. Important acquisitions include about 3,000 specimens, mostly from Hawaii, collected and given by Mr. Otto Degener, 2,807 specimens collected in Cuba by Dr. Richard A. Howard, about 1,300 specimens collected in Idaho by Mr. Arthur Cronquist, 1,047 specimens collected in Mexico by Dr. C. H. Muller, 750 numbers, with duplicates, collected in Mexico by Mr. Robert Stewart, and 2,734 specimens obtained over a period of several years by

Mr. E. J. Palmer, representing cultivated plants growing in the Arboretum.

To other institutions the Arboretum distributed 36,152 specimens; these were necessarily all sent to American institutions this year. Of this number, 26,925 specimens were sent in exchange, while 8,896 specimens were transferred to the Gray Herbarium; the remaining specimens were sent out either as gifts or for identification by specialists. A total of 410 mounted illustrations was transferred to the Gray Herbarium and the Ames Orchid Herbarium at the Botanical Museum. Microfilm to the equivalent value of 1,916 specimens was distributed under a special exchange arrangement. The total number of specimens or their equivalent in mounted illustrations and microfilm distributed by the Arboretum, therefore, was 38,478. Additional thousands of specimens were set aside for shipment to European herbaria after the war.

Twenty-three loans, totaling 2,003 specimens, were made for study by specialists in 15 American institutions. For study by members of the Arboretum staff, 31 loans consisting of 2,280 specimens were borrowed from 12 institutions.

A total of 2,037 cards was added to the catalogue of references to new species and other important literature appertaining to woody plants, this catalogue now consisting of 133,732 cards. The collection of negatives representing types and other critical specimens now totals 4,211, as 73 negatives were added during the year.

Routine herbarium work has been continued under crowded conditions, only the most essential specimens being added to the general herbarium, and the less necessary material being stored in generic order in cardboard cases. Although this material is thus available to students, the need for additional steel cases and space to place them becomes more acute each year. Our accessions show a decrease from the figures of normal years, as expected under the present international conditions. Because of this decrease, the mounting department is now practically up to date. Herbarium work has included routine incorporation of clippings, typed descriptions, and illustrations.

Members of the herbarium staff continued their special studies, with the result that numerous technical papers were prepared for publication, while many identifications were made and various parts of the herbarium were better organized. Professor Rehder brought the bibliographical supplement to his *Manual of Cultivated Trees and Shrubs* nearly to completion, this comprehensive work so far based on the library resources of the Arnold Arboretum. There remain to be checked a number of references to literature not available here, to be searched for in other libraries. Dr. Smith, in collaboration with Professor Bailey and Dr. Nast, continued his study of ranalian families, also working on special groups of Papuanian, Polynesian, and tropical American plants. Dr. Johnston has continued his work on the flora of the intermontane plateau of northern Mexico, the first part of his report being published, the second part in press, and the third part now being prepared for the printer. Dr. Raup devoted much time to the com-

pletion of a report on his Mackenzie Mountain Expedition collections of 1939, which is nearly ready for publication, and to a study of *Salix* from the Hudson Bay and Labrador Peninsula regions. The latter is in press, but, because it became necessary for him to devote much time late in the year to preparation for the Alcan Highway trip, mentioned above, completion of the former must await his return from the field. Dr. Kobuski brought to completion his study of the tropical American members of the genus *Ternstroemia*, and was granted leave of absence for military service in October. Mr. Palmer continued to collect specimens of plants cultivated in the Arboretum, also carrying on his studies of *Quercus* and *Crataegus*. Dr. Allen's studies of the American Lauraceae were extended, especially of Mexico and Central America, and she continued her work on the genus *Halenia*. Dr. Perry has further studied the Papuan collections assembled by the Richard Archbold Expeditions, and the greater part of this valuable material has now been determined and reported on in this Journal, although certain important groups are still under study. Dr. Croizat continued his studies of the families Cactaceae and Euphorbiaceae, giving special attention to the genus *Croton* in North and South America. Dr. Li studied and identified the material of many families of the large Chinese and Indo-Chinese collections accumulated at the Arboretum, preparing several papers for publication. My own work has been largely in connection with Rafinesque problems, especially the preparation of a comprehensive Index Rafinesquianus, now in rough draft stage and to be checked before the final copy is prepared. I have also supplied data on economic plants to various representatives of our armed forces and have worked with Dr. Li and Dr. Perry on Chinese and Papuan botanical problems.

Linnaean microfilms. — A most important accession received in 1942 was a complete microfilm record of the Linnaean herbarium specimens and other natural history collections of Linnaeus, together with records of his manuscripts and of all books, including his own volumes, in which he had made marginal annotations. This important record, in the form of a positive microfilm, came as a gift from the Linnaean Society of London. I took some part in the negotiations with the Carnegie Corporation which resulted in a special grant to the Linnaean Society for the purpose of defraying the cost of making this record. The Council of the Linnaean Society, in applying for the grant, offered to deposit a complete microfilm record in some American institution. As a matter of fact, it generously sent two complete sets and later directed me to transmit one set to the Smithsonian Institution in Washington. There are about 160,000 exposures in each set.

For those parts appertaining to the herbarium material, we have had a new negative film prepared from the positive and have arranged to have enlarged prints made so as to have a graphic representation of each herbarium specimen. When the task is completed we will then be able to provide prints at cost to workers in other American institutions who may

have problems to solve in reference to the identity of Linnaean types. The films appertaining to the Linnaean types of shells, insects, fishes, and other animals have been deposited in the Museum of Comparative Zoology in Cambridge.

Bibliography. — Dr. Verdoorn edited volumes 8, 9, 10, and 11 of his new series of plant science books and vol. 7 of *Chronica Botanica*. As he has been in touch with the Botanical Garden at Buitenzorg, Java, since 1930, he has been giving part time service to the Board for the Netherlands East Indies, Surinam and Curaçao in Washington as botanical advisor, and in that capacity he organized the Central Depository Library for the Netherlands East Indies in New York. The objective here is to assemble all foreign publications that normally would have been received by scientific and technical libraries in the Netherlands East Indies, the plan being to ship these to Java when conditions permit. In connection with the preparation of the *Index Botanicorum*, card indices to all literature dealing with botanical and horticultural history, bibliography, general biology, and the history of botanical gardens are being prepared. Some ten thousand references have been added to the standard forms on which information regarding individuals is being compiled, and these data have been carefully arranged for ready reference. Chiefly with the objective of gaining more time for historico-botanical investigations, *Chronica Botanica* will be discontinued as a serial and beginning with volume 8 will appear in book form. The first issue of a new series devoted to the history and methodology of botany and zoology is in press.

The Library. — At the end of the fiscal year the library contained 45,313 bound volumes, 13,322 pamphlets, and approximately 18,900 photographs. Accessions amounted to 191 volumes and 139 pamphlets. The cards added to the periodical and author catalogue numbered 550, of which 150 contained bibliographical information, and 700 slips were added to the files which supplement the printed author and subject catalogues of the library. About 250 volumes have been loaned to other libraries and many have been borrowed for use here, the University messenger service helping greatly in such exchanges. The demand for photostats and microfilms continued to be large, and prints of two of E. H. Wilson's collections of photographs numbering about 300 were made to order and sold. Exchanges of periodicals with foreign countries were even further curtailed due to the risks of shipping.

Atkins Institution of the Arnold Arboretum, Soledad, Cienfuegos, Cuba. — Because of war conditions and restrictions on travel this unit has been operated on a routine basis. It was not possible to assign graduate students to the Atkins Institution for tropical experience even on a fellowship or scholarship basis, partly because of the reduction in the number of graduate students at Harvard University, partly because of restrictions on

travel. During the summer and autumn of 1942, further transplantings were made in the palm section, and the temporary foot bridge across the stream was replaced by a more permanent causeway. Because of the unusually dry autumn and early winter, the reservoirs became dry, and advantage was taken of this to remove the accumulated silt. There was at this season an acute shortage of water, the small stream from which water is pumped becoming almost dry. Two springs in the newer parts of the garden were investigated, and this resulted in the development of excellent wells of clear water sufficient for the garden and house requirements. This, however, made it necessary to reorganize the pipe lines throughout the garden, which was in part accomplished. It is indeed fortunate that this additional source of water could be developed within the garden area. In the early spring some of the larger trees were transferred from the nursery to their permanent sites in the garden. Maintenance has been hampered because of lack of gasoline for the power mower. At the request of the United States Department of Agriculture, a nursery plot for *Hevea brasiliensis* was prepared and one shipment of 200 budded stumps was received from Costa Rica. This shipment was unfortunately delayed in transit, the resulting growth being poor. Over 400 pounds of *Cryptostegia grandiflora* seeds were supplied to the same organization and to the Bureau of Economic Warfare. Conditions being what they are, only 174 packets of seeds were shipped in exchange and 79 packets were received. The rainfall for the year was 49.29 inches, and the lowest temperature recorded was 45°, on February 24, 1943.

Publications. — The usual numbers of the Journal were published, the new and more compact format adopted at the beginning of 1942 permitting the publication of more material per number. The new publication *Sargentia*, the name honoring Dr. Charles Sprague Sargent, continuing the Contributions from the Arnold Arboretum, received an auspicious beginning with three numbers. The first of these, published in July, included Dr. Smith's study of the important Fijian collections assembled in 1940–41 by Mr. Otto Degener, on the Pacific cruise of the "Cheng Ho," sponsored by Mrs. Anne Archbold. In October Dr. Li's comprehensive monograph of the family Araliaceae in China was published. Number three, appearing in January, contained a revision of the genus *Sabia*, by Dr. Luetta Chen, and an extended discussion of the genus *Ormosia* in China and Indo-China, by Dr. Chen and myself. A fourth number of *Sargentia*, with articles by Dr. Raup and Dr. A. E. Porsild, is now in press. *Arnoldia* was issued as usual, and its mailing list was revised. A bibliography of the published papers by staff members and students follows.